

MEDITERRANEAN-CLIMATE BULBS: PROPAGATING FOR CONTAINER PRODUCTION

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Wintergreen Nursery is a small wholesale nursery devoted to the new and unusual, particularly among blooming perennials of Mediterranean climate areas. One of my special interests within this diverse group has been the plants commonly lumped together as ‘bulbs’; these include some of the showiest and, for the gardener, most rewarding of all perennials. I have been pleased to find that many personal favorites, especially South African and Pacific Coast natives can be economically propagated and presented for sale in ordinary nursery containers, from 4 in. pots to 2-gal. cans, during growth and bloom. Unlike florist crops, these are specifically grown and presented for outdoor garden use.

A variety of ‘low-tech’ strategies have been followed, reflecting both our own goals and the reproductive features of particular plants. I would like to briefly share some of our experiences here.

PLANT FEATURES AND PROPAGATING OPPORTUNITIES

The most distinctive features of the ‘bulbs’ in general, regardless of plant family, are vegetative structures adapted for storage of water and nutrients during times of climatic stress. In many cases they also serve as important instruments for natural increase. Differences in these structures have a direct bearing on strategies for commercial propagation.

True *bulbs*, such as those of the lilies and narcissus, are contracted stems crowded with fleshy, reduced leaves known as *scales*. Generally they persist for many years, increasing in size over time. Many have incipient growth buds, or tissue capable of producing them, at the base. These may naturally produce offsets, which can be separated from the main bulb, or they may form bulblets along the basal plate in response to injury to the main bulb. In some cases individual scales are capable of generating whole new plants, as described below.

Corms are common structures in the Iris Family (*Gladiolus* and *Freesia* are familiar examples) and West Coast representatives of the Amaryllis Family (*Brodiaea* and others). They are basically swollen stem-bases, with apical buds for next season’s shoots and often with accessory shoot-buds at basal and intermediate nodes. Corms are more transitory structures than true bulbs, often

lasting only a single season but sometimes producing large quantities of new corms and smaller *cormlets* in the process. This provides us a means of rapid increase.

Tubers are a little more confusing, since many plants refuse to fit the textbook definition. In general, they are swollen underground stems, or portions of stems, with solid cores and incipient shoot-buds at various points (the *Zantedeschias*, or calla lilies, are good examples); however, we may also speak, as in the case of the *Alstroemerias* (Peru lilies), of *tuberous roots* associated with a comparatively reduced shoot-crown.

Seeding habits and structures are also important with many species. Many "bulbs" are prodigious setters of seed—either through sheer numbers of flowers, as in *Crocasmia* and some other South African irids, or through large seed vessels with dozens or hundreds of seeds, as in the lilies. Structure of the seed pods in many members of the Lily, Amaryllis, and Iris Families make the seeds easy to collect and separate, and their viability tends to be quite high. Further, we have found it surprisingly easy, through moderate isolation, to develop and maintain superior seed strains with respect to such features as overall vigor, flower size, and color.

Below are some examples of the techniques we use.

SEEDING TECHNIQUES

Part of the definition of a Mediterranean climate (including that of much of California) is a combination of cool, moist winters and warm, dry summers. Thus plants of these climates are generally adapted to germination and growth of seeds during the winter and early spring, when a supply of moisture is assured. We have two alternative techniques for exploiting this habit in seeding of Mediterranean-climate bulbs. Most are simply sown in fall, with the onset of cool weather. We scatt them rather densely in flats of a light, porous medium and barely cover them with more of the same (there is no magic in a particular formula, but ours includes 1 part of a redwood sawdust/sand UC-type mix, 2 parts medium grade perlite, and 0.5 to 1 part screened peat moss, with 3 oz. per yard Truban as a damping-off preventive). Large, fleshy seeds like those of *Crinum* (the corn lilies) are left partly or completely exposed; covering them only encourages fungus decay. The flats are placed either outdoors in a small shade house, or on a shady bench within a large unheated greenhouse. In either case they receive midwinter night temperatures from 30 to 40 °F but little or no direct frost. Most species are ready to transplant to 2 in. pots or open flats by mid-spring, though a few, like the *Calochortus* (maiposa lilies) remain too small and delicate and are held over for a second season.

The second alternative, which seems to give more consistent germination for native lilies and certain others, is to stratify the seeds in Ziploc bags containing a moist cutting medium (3 parts perlite, 1 part screened peat moss). This method also permits an early start and extended first growing season, which minimizes growing time to first bloom. The bags are refrigerated at around 40 °F until germination begins, usually at 2 to 3 months. Then they are flatted and treated like dry seeds.

DIVISION

Since we are interested in a number of specific clones selected for vigor and floral features, and since the structures themselves are so amenable to simple division and some more brutal variations, these are our most common techniques for bulbs. Usually we save plants from one year's mature crop and divide the bulbs, corms, or tubers into appropriately-sized clusters, replanting these in the same size containers. This oversimplifies things a bit, since there is no easy formula for the "appropriate" number of units per container; bulb genera, species, and even individual clones vary enormously in profuseness of growth and minimum age of structures for onset of bloom. Our object is, wherever possible, to have blooming plants of salable size in the next blooming season after division.

There are various cases of special interest. Some bulbs, like *Zephyranthes* and *Habranthus* (rain lilies) in the Amaryllis family, have essentially no dormancy in our climate and are divided almost anytime (though with care to keep root masses reasonably intact). Others, like the *Rhodohypoxis*, have a seasonal dormancy but also an extended growing season, and may be divided during active growth. Some of the South African irids permit a sort of two-fold division. Cormlets which have formed either along last year's growing stems (as in the babianas, or baboon-flowers) or on the surface of the old main corm can be stripped away, often in large numbers, and planted in flats for a later year's crop.

Some features call for special caution on our part. Many cormous plants, like the brodiaeas, begin their fall or winter growth season with delicate rhizome-like pegs radiating in all directions from an old corm; these should not be disturbed until new corms have formed at their tips. Some of the summer-dormant alstroemerias are especially troublesome: Their tangled masses of tuberous roots must be carefully teased apart, leaving the rather delicate growth-crowns intact.

There are some species, too, which do not separate neatly and need some encouragement from a hatchet or large knife; *Crinum* (corn lily) and *Eucomis* are good examples. Fortunately, most of

these heal rapidly, and the injury to older bulbs may even encourage production of offsets along wounded surfaces. Many solid-cored tubers must be subjected to chopping, slicing, or a variety of other abuse to make appropriate pieces for planting. The zantedeschias, or callas, are a good example of plants which take this sort of indignity in stride.

SCALE CUTTINGS

Among our bulb techniques, probably the most interesting is that of bulb scale cuttings. Unfortunately, this technique is difficult to apply to any but the most loosely knit true bulbs. With selected clones of our California native lilies, we knock out and wash off large stock bulbs and break off a number of scales, trying to get a bit of the basal plate with each scale. The scales are dipped in a mild rooting powder (Hormex #3) and inserted in flats like stem cuttings, with at least half of each scale showing above the medium. Within two or three months bulblets form at the base of each scale; then one or more leaves will appear. At this point the plants are potted up. This often promotes a second growth cycle. The most vigorous species, like *Lilium pardalinum*, will produce flowering plants in the second summer.

Certain other relatively large, loose bulbs can be given some variation of this treatment. The broad scales of *Urginea maritima*, the sea onion, will produce multiple plantlets from each scale base. We have also experimented haphazardly with various *Crinum* species and hybrids, with mixed results.

All of these techniques have proven commercially viable for container plant production and offer a welcome break from more conventional routines.

MIKE EVANS: A question for Ellen Sutter. In the plants you have worked with or observed, in the roots transformed by bacterial action, will they be mycorrhizal, or will they later become mycorrhizal on their own?

ELLEN SUTTER: We did not deal with that question in our work, so I do not know.

GARY MATSON: Does forsythia have fully differentiated flowers when cuttings are taken and will it still root after the flowers have formed?

BOB TICKNOR: The flower buds are visible now (September) but, normally, hardwood cuttings are taken in winter when the flower buds are fully developed, and they root very easily.